

# Production Theories (1)

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# Firms: Making the Goods

- A **firm** is any business entity that produces and sells goods or services.
- Production is the process by which the transformation of inputs to outputs occurs.
- A fixed factor of production is an input that cannot be changed in the short run.
- A variable factor of production is an input that can be changed in the short run.
- The firm's **production function** is the mapping that tell us, for a given set of inputs, how much output a firm is able to produce.
  - Cobb-Douglas production function:  $q = f(K, L) = K^\alpha L^\beta$

# Firms: Making the Goods

- Marginal product is the change in total output associated with using one more unit of input.

$$MP_L = \frac{\Delta q}{\Delta L} \text{ or } MP_K = \frac{\Delta q}{\Delta K}$$

- The marginal product increases with the addition of the first few workers.
  - Specialization is the result of workers developing a certain skill set in order to increase total productivity.
- The law of diminishing returns states that successive increases in inputs eventually lead to less additional output.

# The Cost of Doing Business

- The cost of production is what a firm must pay for its inputs.
- Total cost (TC) = Variable cost (VC) + Fixed cost (FC)
  - ① A variable cost (VC) is the cost of variable factors of production, which change along with a firm's output.
  - ② A fixed cost (FC) is the cost of fixed factors of production, which a firm must pay even if it produces zero output.

# The Cost of Doing Business

- Average total cost (ATC) is the total cost divided by the total output ( $q$ ).

$$ATC = \frac{TC}{q} = \frac{VC}{q} + \frac{FC}{q}$$

- 1 Average variable cost (AVC) is the total variable cost divided by the total output ( $VC/q$ ).
  - 2 Average fixed cost (AFC) is the total fixed cost divided by the total output ( $FC/q$ ).
- Marginal cost (MC) is the change in total cost associated with producing one more unit of output.

$$MC = \frac{\Delta TC}{\Delta q}$$

# The Reward of Doing Business

- Revenue is the amount of money the firm brings in from the sale of its outputs.
- Total revenue (TR) = Price (p) × Quantity sold (q)
  - The price (p) is determined in the demand of the market (e.g.,  $p = a - b \cdot q$ ).
- Marginal revenue (MR) is the change in total revenue associated with producing one more unit of output.

$$MR = \frac{\Delta TR}{\Delta q}$$

# Putting It All Together

- The profits of a firm are equal to its revenues minus its cost.

$$\pi(q) = TR(q) - TC(q)$$

- The goal of the firm is to maximize profits.
- In the maximum of the profit,

$$MR = \frac{\Delta TR}{\Delta q} = MC = \frac{\Delta TC}{\Delta q}$$

# Accounting Profits vs. Economic Profits

- Accounting profits are equal to total revenue minus explicit costs.
- Economic profits are equal to total revenue minus both explicit and implicit costs.